Livestock Waste Management Opportunities in S.E. Asia

M2M and World Bank collaborative project

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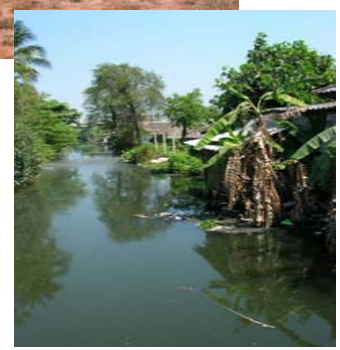
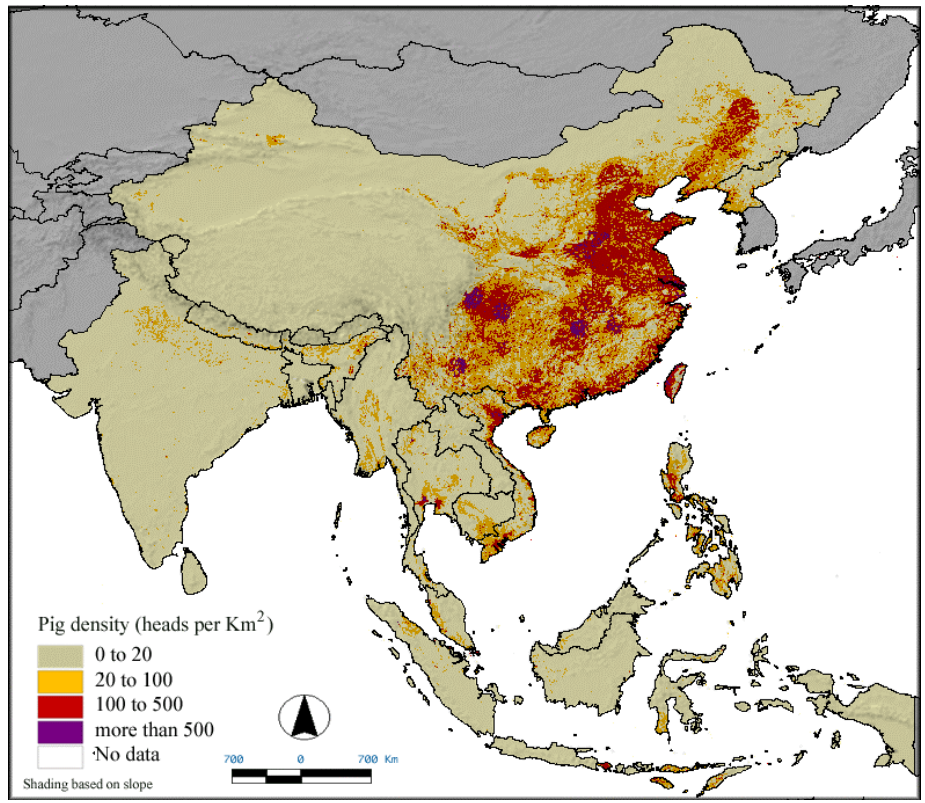


Project Background

- Recently approved GEF project @$21 million managed by World Bank
- Since 2004 MOU between World Bank and EPA AgSTAR program
  - AgSTAR program serves as project advisor on World Bank project team
  - Participated on pre-appraisal and appraisal missions to develop project architecture
- Three country areas involved:
  - China, Guangdong Province
  - Thailand, Racthuburi and Chonburi province
  - Vietnam, Ho Chi Minh City and Hanoi
- Food and Agricultural Organization (FAO) has regional coordination role
- Project implemented over a 5 year period

Project Background

- Primary Purpose: Reduce negative environmental and health impacts caused by confined livestock in region
  - Discharge to surface waters main issue
- Project has an air component
  - Japan PHRD Grant Fund for Climate Change adds $250,000/country



Project Country Profiles

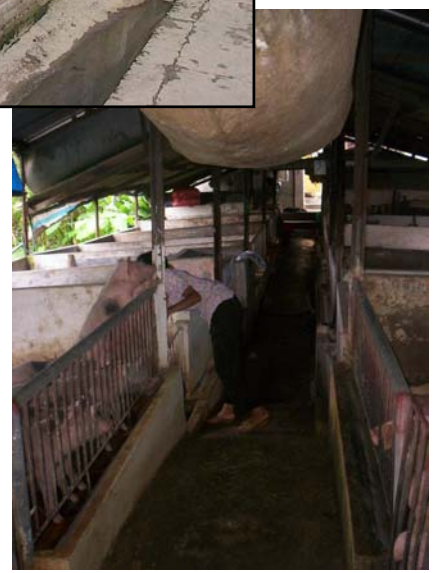
- Opportunities
  - Pig waste handled as liquids and slurries
  - Appropriate candidate for anaerobic treatment and gas recovery
  - All countries desire gas recovery technologies
- Project Benefits:
  - Organic (BOD) stabilization
  - Pathogen reduction
  - Nutrient conversion
  - Odor control
  - Greenhouse Gas reduction
  - Energy - adds additional revenue stream to farm

	Standing Pig Population (millions)	Methane Emissions (Gg)
China[+]	47	1,197
Thailand	7	1,786
Vietnam	25	123
Total	79	3,106
as % of World	>50%	>25

[+] China is a current *Methane to Markets* Participant

Large Range in Farm Scale

- Thailand
  - Very large corporate type farms >20,000 and very small family farms 10-50 pigs
- Vietnam
  - Very small family farms 10 – 200 pigs
- China
  - Moderate scale farm 100 – 2,000



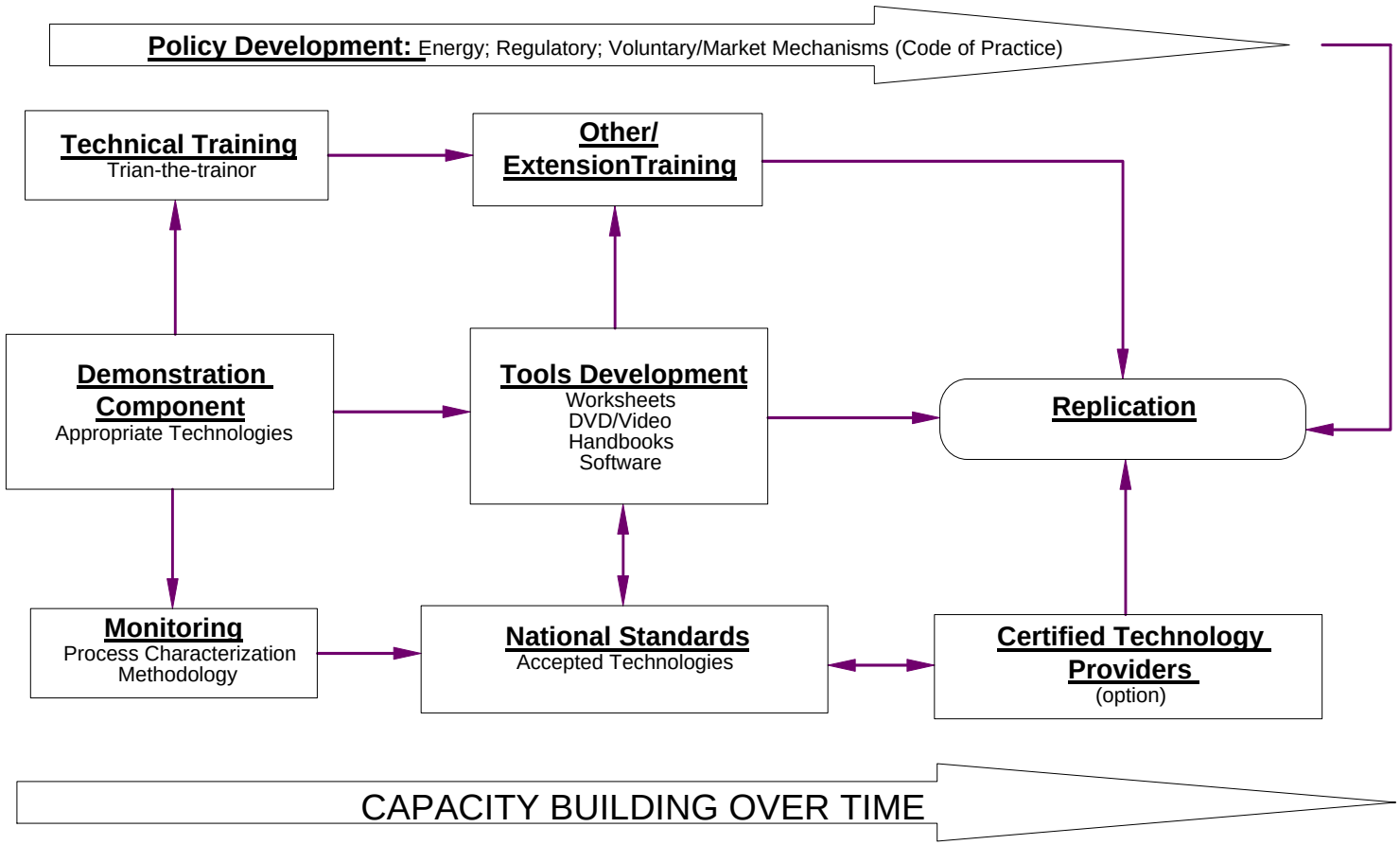
Waste Handling and Collection

All countries solids collection and hose flush

Waste Management

1) Land application of nutrients limited to solids fraction only
2) Have discharge standards
3) Pollution load is catastrophic

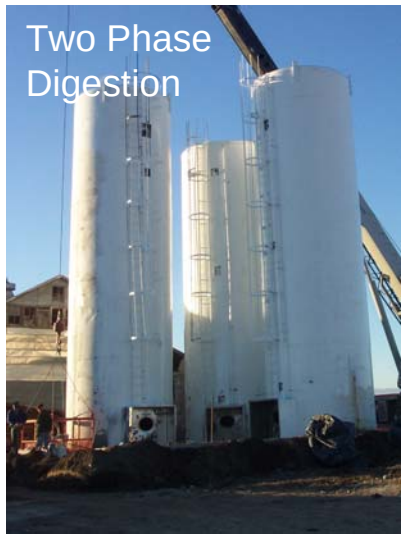
Project Design



Demonstration Overview

- Objective: Demonstrate an array of processes, or combination of processes that prevent water pollution
  - Greenhouse gas and air quality are secondary objectives
  - Systems must be affordable
    - All countries desire systems with gas recovery
- Many system types
  - Cost implications
  - Gas use options vary
- Projects are on-farm and communal
- Demonstration component phased in over time
  - Large potential for *M2M Project Network*
- Land application and nutrient management planning approaches are being introduced.
  - Long term implications for project
  - Some countries limited opportunity i.e., fish pond feed resource

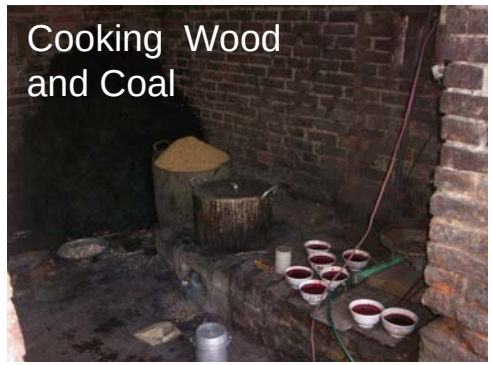
On-Farm Demonstrations



Communal Digester N. Vietnam

- Social structure allows for communal development, operation, and management of covered lagoon
  - 200 families
  - @1,500 pigs
- Village waste canal to be constructed
  - Designed for rainfall exclusion
- Gas purchased and used as cook fuel for families
  - Distributed and measured in refillable bags

Gas Use Opportunities

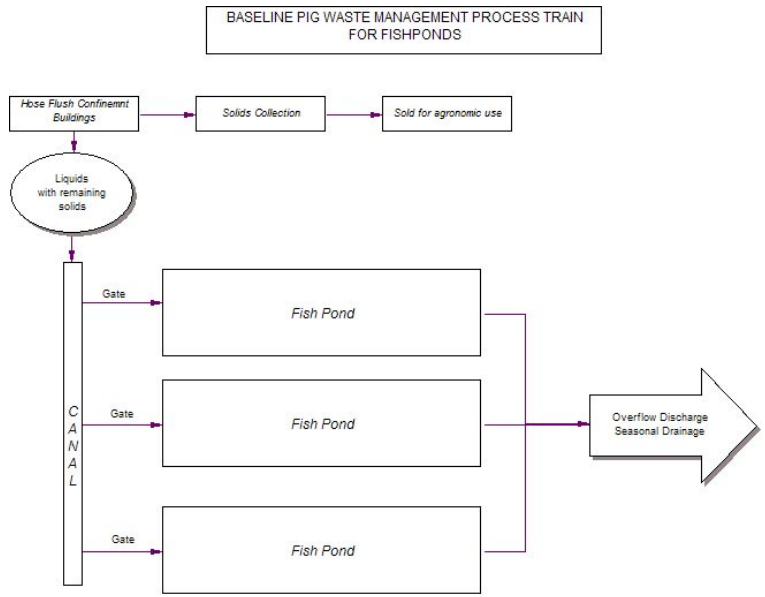


Nutrient Management – Tropical Climate Options

- Land application relative to crop need (N and P)
  - Most common approach includes temperate climate approaches – US, Europe
- Wetland
  - Aquatic crops remove nutrients
- Fish ponds
  - Waste used as fish feed resource – China, Vietnam, Thailand
- Treat and discharge - sewage
  - Livestock waste comparatively high strength very expensive
  - Understanding mass loading critical

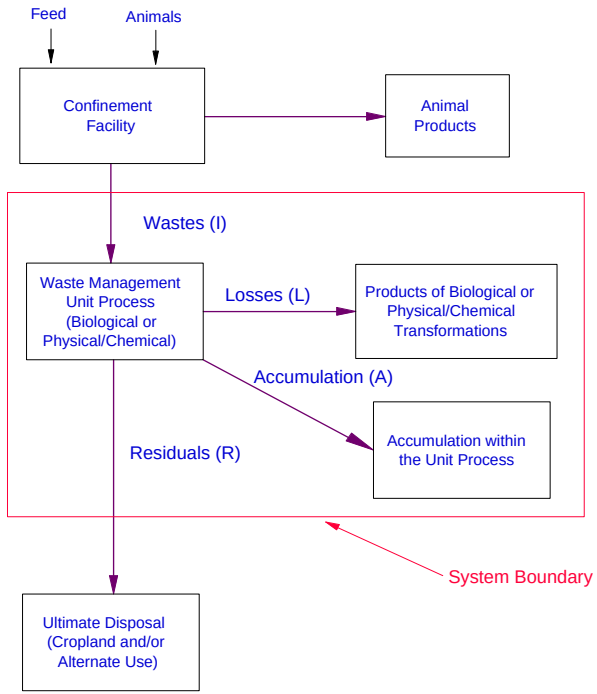
Critical Issues

- Current demonstration component has wide range in installed cost
  - $7-15 per pig (covered lagoons)
  - China two phase system
    - $55-100 per pig
- Systems must be affordable
- Policy component
  - Energy financial incentives may not be enough to offset extreme costs
  - CDM payments



Monitoring Component

- Measuring pollution mitigation needs credible basis
  - Baseline WMS
    - Direct discharge
    - Storage
    - Fishponds
  - Methods and Protocol
- Monitoring supports policy, technical, and tools elements



Performance Parameters
Oxygen demand
Nutrients - Nitrogen & Phosphorus
Indicator Organisms
Metals

Where : L = I -(R+A)
(I and R are measured and L and A are estimated)

Next Steps

- Project approval meeting scheduled for June 2006, Vietnam
  - Final technical specifications first phase demonstration
  - Monitoring details
  - Regional coordination
  - Integration of GHG element
  - Methane to Markets

- First phase demonstrations start construction late 2006 – dry season
- First supervision mission early 2007